Ohio Agricultural Experiment Station.

BULLETIN 63.

WOOSTER, OHIO, NOVEMBER, 1895.

ORCHARD SPRAYING.
NOTES ON VARIETIES OF RASPBERRIES.

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BULLETIN

OF THE

Ohio Agricultural Experiment Station.

NUMBER 63. November, 1895.

ORCHARD SPRAYING.

BY W. J. GREEN.

The following notes on fruits of different kinds were prepared during this and former seasons and it was at first intended to publish them in separate parts, as material was collected, but the edition of Bulletin 48 on spraying, as well as one sent out as early as December, 1891, having become exhausted it has become necessary to prepare another devoted wholly, or in part, to that subject. It is thought best, however, to incorporate these fruit notes along with directions for spraying.

APPLES.

It has been pretty fully demonstrated that the failure of apple crops in recent years is due largely to the destructive action of the apple scab fungus, on flowers, fruit and foliage.

It was noted in the Bulletin of this Station for December, 1891, by Mr. U. T. Cox, of Lawrence county, who conducted experiments in the orchard of Nelson Cox, his father, that the foliage is preserved by spraying, and the same effect was observed at Columbus, but in a more marked manner, in the following season. Similar results have since been noted, particularly in 1894, in the Station orchard, and more strikingly in Mr. F. P. Vergon's orchard, in Delaware county. Along with this action of fungicides in preserving the foliage, has been noted, in every case, the fact that there has been less premature dropping of apples from sprayed than from unsprayed trees. It is also a fact that treatment has increased the size of fruit. The most striking illustration was found in 1894, in Mr. Vergon's orchard. From an unsprayed tree of Rome Beauty one and one-fourth bushels of rather inferior apples were picked, while from a sprayed tree of the same size, growing alongside, there were gathered six and one-half bushels of fine fruit, worth at the time at least $3.00 more than the

fruit from the other tree. This is an extreme case, but the same cause operated, in a greater or less degree, in all the orchards of the State.

The trouble seemed to grow worse, gradually, and to culminate in 1893. In 1894 there seemed to be a slight improvement in some sections, and in 1895 all orchards, so far as observed, were nearly free from the disease. In our own experiments in 1895 no result was obtained in spraying for the apple scab, and so far as known, unsprayed trees have yielded as fine fruit as those which were treated.

The early part of the season was cool and very dry, and the latter condition prevailed up to the time of picking. There were a number of showers during the spring and summer, but they were mostly light and passed quickly, damp, cloudy days being very few. Under such conditions the apple scab fungus could not develop, and it was hard to find any evidence of it until late in the season, but even then it was not noticeable. It did no harm to either fruit or foliage, and to the unpracticed eye unsprayed fruit was as fine as that which had been sprayed.

This raises the practical question, what may we expect in the future, and is it advisable to spray or not to spray? The scab fungus is not killed out completely, but it is not possible to predict how long a time it will require in which to develop sufficiently to do serious harm again. Much depends upon the weather, which cannot be foretold.

Such conditions as those of last season are very rare, and damp weather is more likely to occur than not in spring and early summer. One or two such seasons may bring our orchards back again to the same condition as that previous to 1895. Nature has done more for the apple ower in a single season than any number of spraying machines could all time, even though the condition which now presents itself is not a permanent one. It is one which may be taken advantage of, however, and it is clearly the part of wisdom to do so.

It is well known that it is the part of a fungicide to prevent rather than to cure, hence it will be much easier to hold the disease in check from now on than to get it under control after it is once established. It has been partially controlled on bearing trees, even in bad seasons. In our experiments in applying a fungicide to young trees from the time of planting, which have been carried on three seasons, the results are already evident; but now, of course, all are brought to the same condition, both sprayed and unsprayed, and we must start anew.

The result thus far, however, plainly indicates that the course to pursue with young trees is to begin spraying them as soon as planted, using the same preparation against fungi as advised for bearing trees. Even if this use of fungicides were of no practical value the improved looks of the trees in the clean, bright appearance of the bark is sufficient

to warrant the small amount of labor required to spray young trees. It will pay, however, to spray young apple trees because of the reduction of labor in the future, and because of the greater certainty of results which will attend continued efforts in this direction.

No experiments have been conducted here to test the efficacy of the arsenites against the apple worm, as that matter has been considered as settled. Two sprayings have usually been recommended, with Paris green or London purple, one just after blooming and the other within a week or ten days following. There has been complaint that this does not answer the purpose, to the extent desired, and this agrees with our experience. We have added six ounces of Paris green to each barrel of Bordeaux mixture, after the fruit has set, making two applications in this manner. This has not given satisfactory results in checking the apple worms, but the past season two additional sprayings were made with Paris green, with evident benefit. Seventy-five to eighty-five per cent. of apples free from worms were thus secured. A caution must be added, however, as there is danger in the use of arsenical poisons after the apples have turned down so as to make a lodging place for the poison around the stems of the apples, especially in case of the early kinds. The matter is referred to here merely to give a hint to those who have not had satisfactory experiences in spraying for the apple worm, with the hope that with a little more thoroughness better results may be secured.

The matter of thoroughness is one that needs attention in all cases. There is but little use in beginning to spray for either insects or diseases unless careful attention is given to details and the work is thoroughly done. When performed as it should be there is no work on the farm that pays better, and to the professional fruit grower the spray pump is as essential as the cultivator. Some seasons it is more useful than others, but he cannot afford to take the chances of loss, at any time by neglecting to spray.

Regarding the number and dates of sprayings which should be made to apple trees, it is not possible to lay down general rules. Instead of observing dates it is better to be guided by the stage of growth, and the number of applications will be governed by the weather and the variety. Spraying should be more frequent in wet weather than in dry, not merely for the reason that the rain washes the mixture off, but because the fungus develops more rapidly under the first named conditions, than when the supply of moisture is scanty.

It is well to make two sprayings before the time of blooming, and if the weather is damp and the trees are late in showing bloom it will do no harm to add a third. The first should be made before the leaves are open, at which time the quantity of mixture required is small, and the work is

quickly done. These are considerations in favor of spraying early aside from effectiveness, and taking all things into account there are abundant reasons for beginning operations in good season. There are also reasons for making an end of the work at the earliest date possible. Grimes' Golden, Maiden's Blush, Belmont and Ben Davis, and no doubt other varieties, are injured by the mixture; it having the effect of causing a roughened, russet appearance on the skin of the apples, if used too late in the season. One spraying after the apples have set is about all that these varieties will endure, without considerable disfiguration. Most others that we have tried do not show much injury, even if sprayed twice after the fruit is set. The effect noted does not affect the growth of the apples but injures the appearance merely, and may in some cases, detract from the market value. Although not a matter very serious in consequence it is well to guard against it and to prevent whatever loss might occur.

Whenever Bordeaux mixture is used after the apples have set it is well to add six ounces of Paris green to each barrel of the mixture, and to continue the use of the latter alone once or twice thereafter. It will be seen that the above is very nearly the same as the course formerly advised for the use of Bordeaux mixture on apple trees, nor does it differ very materially from that recommended by other experimenters, but still we should like to make it plain that we think it best to do most of the spraying to prevent the apple scab before the trees bloom, and to do just as little thereafter as need be.

There is considerable difference in the susceptibility of varieties of apples to the scab, and as might be expected, spraying does not benefit all alike. Locality exerts an influence also, especially differences in elevation. The following notes are made from experiences with varieties that have come under our observation:

Baldwin.—Seems not to be very subject to the disease, and, so far as we have observed, spraying has not benefited it greatly. In some cases the fruit appeared to hang on better where the trees were sprayed than if not. Spraying has been beneficial to the foliage in some cases, which is of indirect value to the fruit. From present indications it does not seem that spraying will extend the limit of the Baldwin very much to the southward, although such a result might reasonably be expected if spraying does, in all cases, cause the fruit to hang on the trees later in the season.

Belmont.—This variety is very subject to the scab and is greatly benefited by the application of Bordeaux mixture. As before stated, however, but one application should be made after the blossoms fall, because of injury to the fruit if used later than that.

Benoni.—The fruit of this variety has been very much improved and not injured, by spraying with Bordeaux mixture, but the treatment has not seemed to have much effect on the foliage.

Ben Davis.—A very marked effect was noticeable in southern Ohio, on the foliage of this variety, when sprayed. The fruit does not seem to be very much injured by scab, but the foliage is more susceptible to the disease than any other that has been noticed, except Rome Beauty. The fruit has been very much injured in appearance by over spraying, and it seems proper to give special caution not to spray it more than once after the fruit is set.

Early Harvest.—The same remarks apply to this as to the Belmont.

Grimes' Golden.—This variety does not seem to suffer greatly from the scab, and we have not seen much benefit from the treatment given it. Some injury has been done the fruit, but this has not been very marked.

Jonathan.—We have not had a very good opportunity to note the effect of spraying on this variety, but the results have been negative.

Maiden's Blush.—This variety is also very subject to the apple scab, and spraying has had a marked effect in improving the appearance of the fruit, and increasing both size and quantity. Some damage has been done to the fruit when over sprayed, but not so much as in the case of the Belmont.

Newtown Pippin.—No variety that we have sprayed has responded more satisfactorily and given greater profit for the labor expended than this. It is not far from the truth to say that without treatment this valuable variety is practically lost to the orchardists of the State, and our experiments show that it may be restored by the use of Bordeaux mixture. Both foliage and fruit suffer from the disease. Some damage to the fruit has been done by spraying, but it was hardly noticeable.

Northern Spy.—This is also a susceptible variety to the scab, and is greatly benefited by spraying. Although the fruit hangs on better if sprayed, and keeps better, than when not treated, it is still practically a fall apple in most parts of the State. We have found it more difficult than most kinds to keep free from the apple worm, and one of the easiest on which to control the scab.

Peck's Pleasant.—We have had no marked results in spraying this variety. In some localities, especially on low lands, the skin shows a dingy or smoky appearance, owing to the presence of some fungus, and this is removed by spraying, but further than this no improvement has been noted, although full opportunity has not been had for experimenting upon it.

Rambo.—This variety has been almost a failure in most localities on account of the scab, because of the effect both upon fruit and foliage.

We have not had full opportunity to experiment upon it, but it is benefited by the treatment, and the injury to the fruit is not great.

Red Canada (Richfield Nonesuch).—The same observations apply to this as to the Rambo. There seems to be no reason why this choice variety might not be restored to its former estate by spraying.

R. I. Greening.—We have not experimented fully with this variety, but it is less subject to scab than most others. On low lands it has the same discoloration found on the Peck's Pleasant and Rome Beauty, which spraying removes.

Rome Beauty.—This variety is very subject to the scab, and on low lands the fruit is badly discolored. There is also a marked contrast in the appearance of the fruit on the lower and upper branches. The foliage suffers more than the fruit, hence where spraying is practiced there is a marked improvement in condition of the leaves, and the fruit is increased in size accordingly. No variety that we have experimented upon has yielded better results than this in the improvement of the fruit in color and size, and increase in quantity. The mixture does not injure the fruit to any extent.

Roxbury Russet.—We have not noted any advantage in spraying this variety.

PEARS.

Essentially the same course is advised for pears as for apples. Still more care must be taken not to spray too late, however, as the fruit of some varieties is easily injured by the mixture, causing the same russet appearance which has been noted as occurring on apples. This has been noted more particularly on the Angouleme than any other sort and to a less extent on the Bartlett.

The varieties most benefited by spraying, according to our observations, are White Doyenne and Flemish Beauty, to prevent cracking; Vicar and Angouleme. to prevent the smoky or smutty appearance so common to these sorts; Clairgeau and Bartlett, to prevent premature leaf dropping. Of course all the troubles occur on all of the kinds named, and others as well, and the remarks are intended merely to call attention to distinguishing features.

PLUMS.

Most varieties of plums are subject to premature leaf dropping, which prevents the proper ripening of the fruit, and tends to debilitate the trees, and spraying with Bordeaux mixture has been found to be decidedly beneficial.

On this point there seems to be no difference of opinion, and our former recommendations have been fully sustained, but not all orchardists have been successful in keeping the curculio in check with Paris green alone, nor in combination with Bordeaux mixture. This may be due to several causes, but principally to the fact that there have been some unwarranted expectations regarding the matter. Many have thought that if the curculio can be controlled in an orchard, by spraying, that the same thing can be done on a single tree, or a few trees. Quite as unwarranted has been the belief that the treatment ought to work on a small plum orchard, surrounded by peach, and other orchards.

That the curculio can be held in check by spraying has been fully demonstrated, but when the difficulties are increased beyond a certain limit by contiguity with unsprayed trees, the method becomes partially or wholly impracticable. Four applications of Bordeaux mixture and Paris green combined will usually answer in the case of an orchard somewhat isolated, but more sprayings with Paris green must be given if other trees, which harbor the curculio, are close at hand and are left unsprayed. This is not always advisable, because of possible injury to the foliage. The latest and best plan, is to spray three or four times with Bordeaux and Paris green, and then to follow with the curculio catcher as often as need be. In this manner the foliage is preserved and the curculio given a check as well. Finishing with the curculio catcher gives a chance to gather and burn the plums that may be stung. There is a saving in time by this method, besides the other advantages named.

PEACHES.

The foliage of both peaches and American plums is easily injured by spraying, hence the mixture should be reduced about one-half. One application may be made full strength, before the leaves open, and one or two latter, half strength. A full discussion of this subject will be given by the Botanist, in a Bulletin on Peach Diseases.

SPRAYING MIXTURES.

Bordeaux mixture.—This is by far the most important fungicide; so much so that other preparations are used in rare and exceptional cases only. This Station was one of the first to call attention to the value of the dilute Bordeaux mixture for apple scab, and to fully demonstrate its value for this and other purposes. Formerly a much stronger preparation was used, which was somewhat troublesome and quite expensive, hence various other fungicides were employed, but since the value of the weaker Bordeaux mixture has become known it is recommended almost exclu-

sively by experimenters. The formula is varied somewhat, but as used here the ingredients and proportions are as follows:

Copper sulphate (blue vitriol)	4 pounds.
Quick lime	4 pounds.
Water	40 to 50 gallons.

It is safer to buy the copper sulphate in the form of coarse crystals, as the pulverized may be adulterated, although not necessarily.

It is advantageous to pulverize it before using, however, for the purpose of saving time in making a solution. There is a saving of time in using hot water in making a solution, taking a gallon of water to a pound of the crystals.

If the crystals are put directly into the water, solution takes place very slowly, but if suspended in a sack near the top of the water, they dissolve more rapidly. The lime is slaked by pouring water over it slowly and then adding sufficient water to make a milk of lime. It may be slaked in a common wooden pail, and the milk of lime poured off into the copper sulphate solution, leaving the coarser parts of the lime in the pail, after which water is added and the milk of lime poured off as before, rejecting all the lime which may be left after water has been added two or three times.

The actual quantity of lime required is not so much as is advised, but time is saved by taking more than is needed, rejecting that portion which is not readily acted upon by the water. If the lime is fresh, and of good quality, there can be little danger in following this method. No harm follows in case there is an excess of lime, but if the reverse should happen, and there is an excess of copper sulphate, the foliage of trees sprayed will be seriously injured.

The potassium ferrocyanide test has been proposed in order to determine just how much lime to use, but it appears not to be always reliable, nor does there seem to be any need of it, if the lime is fresh.

The question is often asked: Can Bordeaux mixture be kept any length of time without spoiling? No doubt it may, but such a course is not practicable, for after standing a few days, it is apt to give trouble because of the sediment which forms. The fresh mixture works in the pump and sticks to the foliage so much better than that which has been kept a few days that it is just as well to throw away all that is left at any time, unless operations are to be resumed within a few hours.

Stock solutions of copper sulphate and milk of lime are often prepared beforehand, so that by taking a specified quantity of each much trouble in weighing and dissolving is saved. By dissolving the copper sulphate at the rate of one pound to a gallon of water, four gallons would

need be taken each time a barrel of the mixture is to be prepared, and the lime might be treated in the same manner. Still stronger solutions are practicable. One case has occurred, however, where foliage has been injured by following this plan. Whether this happened because of some mistake in the proportions, or a chemical change took place in the lime while standing, is not known. The plan is quite extensively practiced in many sections and will probably come into general use where large operations are carried on.

Ammoniacal solution of copper carbonate.—This is easily prepared by dissolving copper carbonate in ammonia and diluting with water. Two quarts of ammonia will usually dissolve six ounces of copper carbonate, but as ammonia varies in strength more may be required. After solution water is added to make a barrel of the preparation.

Potassium sulphide (liver of sulphur).—Dissolve one ounce in four gallons of water.

White hellebore powder.—One ounce to three gallons of water.

Paris green and London purple.—One ounce to ten gallons of water, except where noted.

WHY AND HOW TO USE THE ABOVE PREPARATIONS.

In order to bring all together, for the sake of convenience in reference, some of the directions already given will be repeated in a condensed form.

Apple Trees.—Spray to preserve the foliage and fruit from the scab, to increase the size of the fruit, to heighten its color and to improve its keeping qualities, also to destroy the apple worm.

Use the Bordeaux mixture before the leaves open, and again just before the time of blooming. Repeat just after blooming, adding six ounces of Paris green. In case of varieties that are not injured by the mixture make another application in about a week. It is well to apply Paris green once or twice more, using the regular strength.

Pear Trees.—Spray to prevent premature leaf dropping and cracking of the fruit; to improve the size, color and keeping qualities, and to check the curculio. Follow the same course as advised for apples.

Plum Trees.—Spray to prevent leaf dropping, and to check the curculio.

Use Bordeaux mixture and Paris green combined, making three or four applications, about a week apart, commencing as soon as the blossoms fall.

Cherry Trees.—Spray for the curculio and slugs, also in some cases to prevent premature leaf dropping. Use Bordeaux mixture and Paris green, half strength, twice after the fruit is set.

Quince Trees.—Spray for fruit spot and leaf blight. Use Bordeaux mixture two or three times after the fruit is set.

Grape Vines.—Spray for grape rot and anthracnose. Use Bordeaux mixture once before the leaves appear, and again before blooming, and twice after the fruit has set, after which substitute the ammoniacal carbonate of copper for two or three sprayings. Unless spraying is begun early and continued until the grapes are fully half size the treatment is not likely to prove very beneficial.

Raspberry Plants.—Spray for the anthracnose. Use Bordeaux mixture once before the leaves open, after which apply it two or three times, half strength, to the young canes only, taking care to keep the mixture off the leaves of the old canes. We have succeeded with this treatment, but many others report indifferent results, for reasons which cannot, at present, be explained.

Gooseberry Plants.—Spray for the mildew and currant worm. Either Bordeaux mixture or potassium sulphide applied two or three times, will prevent the mildew, but the latter is preferable if used when the fruit has attained considerable size. Paris green is often employed to kill the worms, but its use is not advisable, unless great care is taken not to get it on the fruit. White hellebore, either dry or in water, is the best insecticide for this purpose. The time to use it is when the worms are very small and have just begun operations.

Currant Plants.—Use white hellebore for worms the same as above.

APPLIANCES USED IN SPRAYING.

This part of the subject was not touched upon in the last Bulletin, but so many inquiries have been received relating to it that it seems necessary to treat somewhat briefly.

To apply the various mixtures in the form of a spray, a good force pump is needed, and should have all of the parts with which the mixture comes in contact made of brass, or some material that will not corrode. The Deming Co., of Salem, O.; F. E. Myers & Bro., of Ashland, O.; The Humphreys Manufacturing Co, of Mansfield, O., and the Nixon Nozzle and Machine Co., of Dayton, O., as well as several firms outside the State, make good pumps. The same pumps are sold by seedsmen generally, and by most dealers in hardware. It is not a difficult matter to get a good pump, but all dealers do not keep on hand the best hose, nozzles and other necessary appliances.

The Bean-Chamberlain Manufacturing Co., of Hudson, Mich., make a pump with a large air chamber, which has certain advantages. Although the pump itself does not work any easier than most others, and does work

harder than some, yet the man who does the pumping finds that he can keep up a better pressure than with a pump having a small air chamber. He does this by getting up a good pressure before the other men begin spraying, and then a few strokes at frequent intervals will keep it up without such continued effort as with pumps having a small air chamber. The men holding the hose like the pump because the pressure is uniform. It is rather higher in price than most other pumps.

The accessories or appliances which go with the pump are as necessary as the pump itself, and unless these are of the best kind and quality spraying cannot be carried on expeditiously. One man can pump for two or more men to spray, but usually two work to the best advantage, each having charge of a hose attached to either side of the pump.

The hose may be one quarter or one-half inch, but ought not to be larger, and should be of the best quality of rubber, linen insertion, four or five ply. Twenty-five feet of hose is about the most convenient length for spraying apple trees. To this is attached about ten feet of one-quarter inch gas pipe, on the end of which is the nozzle. The B. F. Goodrich Co., of Akron, O., made to order the best hose that we have ever been able to secure, and no doubt other manufacturers of rubber goods can make as good if told just what is wanted, but the hose commonly kept in stock by dealers is seldom satisfactory. An iron gas pipe is as good as brass tubing which was formerly recommended, with the difference that the iron pipe will be found to be full of scales the second season, and at the beginning of each season thereafter. This must be attended to before beginning work, or the scales will clog the nozzles.

The Vermorel nozzle, made by the Deming Co., suits our purpose better than any other. The McGowan nozzle projects a spray farther, but we use the first named almost altogether. It becomes necessary, in spraying large trees, for the men to climb part way to the top, in order to do good work, but most of the spraying is done from the ground. The pump is mounted on a cart, but it might be placed in a wagon, and many prefer this plan, especially if one man pumps for one but other to spray. If possible a pump with an agitator should be obtained, but in case no other plan is feasible a paddle must be frequently used to stir the liquid. To return a stream from the pump is not satisfactory. Various modifications in the above recommendations as to outfit for spraying will suggest themselves, and each one must adapt the means to the conditions. Knapsack and bucket sprayers are useful in a limited way, for vines and brushes, but the general purpose sprayer is some modification of that described above.

NOTES ON VARIETIES OF RASPBERRIES.

All Seasons.—A red variety, which produces a moderate crop in the regular season, and frequently gives a second crop very late. The plants are very strong and sucker freely; the berries are from one-half to three-fourths of an inch in diameter, moderately firm and of good quality. The principal objection to the variety is that it does not produce sufficiently early in the season, to be of any value as a market sort. The late crop might be of some value for home use were it reliable and abundant enough. Taking all things into consideration it is difficult to find enough of value in the variety to recommend it.

Champion.—A small, early blackcap, not in any way superior to Souhegan.

Champ'ain.—A yellowish white variety of the Antwerp class, and needs protection in this latitude. The berries are soft, and are not produced abundantly enough for market purposes, but their fine quality entitles the variety to a place in an amateur's collection.

Columbian.—A purple variety of the same general appearance as the Shaffer. The resemblance between the two is so close that many have considered them to be identical. The Columbian is quite generally admitted now to be superior to the Shaffer in being less subject to anthracnose and a stronger grower, while the berries are firmer and superior for both canning and evaporating. Whether all of the claims which have been made for the Columbian will be sustained cannot be known without further trial, but it seems safe to say that it will supersede both Shaffer and Muskingum, and stand as the best representative of the class.

For the benefit of those who have not given such matters attention it may be well to explain that the Columbian roots from the tips of the branches, the same as blackcap varieties, and that while the fruit is purple in color it has much the same flavor as the red raspberries. It has the advantage, then, over the ordinary red sorts that it does not sprout from the roots. To the farmer, or one who grows berries for home use only, this is an advantage; but to the fruit grower it is of less importance. For canning it excels most red sorts, as the berries do not fall apart so much in cooking, and in flavor it is equal to any. For market it will prove valuable in localities where berries of such color are in demand, but it is particularly to be recommended for home use. It has now been sufficiently well tested so that no one need have any fear in giving it a trial.

Cuthbert.—A well known and reliable red variety. It is not hardy at Columbus but it seems to be so here, and good reports from it are almost general.

Eureka.—An early blackcap of great value. In season of ripening it may be classed as early, the first picking coming about with the second picking of the Palmer. The last picking is as late as the last of the Gregg, thus covering the season of both, giving good pickings all the time. More will be said concerning this variety under the head of Mohler.

Early King.—A valuable red sort, coming just after the Thompson, but earlier than most red kinds. Plants strong and fairly prolific; berries large, of bright color and good quality. May prove valuable for market.

Gault.—A blackcap of the everbearing class. Although this variety has been under observation two seasons, there is still a doubt as to what estimate to put upon it. Our one-year plants fruited but little this season because of injury from frost. It was hurt more by frost than any other variety, but whether because of tenderness or because it happened to be in bloom at the time when frost came the hardest cannot be stated. More than that it has not shown the everbearing habit here. We have nothing, therefore, to offer from our own experience with the variety. It was the opinion of the Horticulturist of the Station that, as seen on the originator's grounds, the principal merit of the variety consisted not in its everbearing habit, but in its ability to produce a good crop at the usual season, when other varieties are in fruit, and of continuing the season even beyond the ordinary date. That is, it appeared to be a promising late variety, even later than Gregg. It surely is a heavy cropper, and the berries being very firm, ship well and are well adapted to drying. Others have seen much to praise in its everbearing habit. Compared with other known kinds which have this peculiarity, it seems to excel them all in quantity of product. It must be classed as a promising variety, notwithstanding its behavior here.

Gregg.—This is still the standard late variety.

Kansas.—This is a valuable variety, and many good things could be said concerning it. It comes in competition with Eureka, however, which is its superior in some respects, being earlier and more prolific. For this reason it is not possible to accord the Kansas the place which many think that it should occupy.

Lotta.—A medium to late blackcap of very great promise. Plants are very strong in growth, healthy and prolific. It excels the Gregg in growth and productiveness, while the berries are slightly larger and darker in color. It begins ripening a few days before the Gregg. It is hard to find fitting words to express an opinion of this variety without seeming to overpraise it. It has been fruited both here and at Columbus, and its behavior has been such as to leave no doubt as to its great merits. There remains, of course, the possibility that it may not do as well elsewhere,

but varieties of such vigor and good health are not usually hard to suit as to soil and climate. It ought to be tried by fruit growers generally.

Loudon.—This has been seen here on young plants of one season's growth only. The berries are large and of fine appearance, but no opinion concerning its value can be given.

Mills' No. 7.—A large, midseason blackcap. The berries are large and cluster very closely at the end of the shoots, making picking rather difficult. It continues in ripening a comparatively short time, which some would consider objectionable, as short season varieties do not, as a rule, give as large yields as those which take a longer time in which to mature their crop. Some growers, however, prefer varieties which mature their crop within a very short time, following with other later, short season sorts. It is an open question which course is the better, but the opinion may be expressed that those who follow the latter plan sacrifice something in yield per acre.

Mills' No. 15.—A midseason blackcap, of about the same season and size as the Ohio. Its principal merit is firmness, fitting it admirably for shipping or drying, but to sell fresh in near market there are many others which are superior to it.

Mohler.—A blackcap, identical with the Eureka. There has been considerable controversy as to whether these names represent the same, or distinct varieties. The whole discussion cannot be given here, but enough, simply to show the reasons for the ground taken. In 1890 the Eureka was sent to the Station for trial, by Mr. J. C. Kester, of New Carlisle, O. In 1891 Mr. D. M. Mohler of the same place wrote to the Station, making inquiries relative to the merits of the raspberry sent by Mr. Kester. A reply was sent by the Horticulturist, and the following card was received from Mr. Mohler in acknowledgment:

NEW CARLISLE, O., *Apvll* 6, 1891.

"DEAR SIR: Very much obliged for report on J. C. Kester Raspbery, which is now being introduced by name of Mohler's No. 1 Raspberry."

(Signed.) MOHLER, TAYLOR & Co.

This and subsequent conversations with Mr. Mohler, led the Horticulturist to believe that the name Eureka had been dropped and Mohler substituted, for good reasons. Mr. Mohler distinctly stated in 1893 to the Horticulturist that he owned all of the stock of the Eureka and had changed the name. A few months later several letters were received, stating that Mr. Mohler now claimed that they were distinct, which was the first intimation of the kind received by the Horticulturist. In 1894 Mr. W. W. Farnsworth and the Horticulturist visited Mr. Mohler, and then learned that he claimed the Mohler to be a seedling of the Eureka, and much superior to it.

Several Eureka raspberry plantations were visited during the same trip, and the impression carried away was that the two were practically identical, even though one might be a seedling of the other, and this was the substance of the report made to the State Horticultural Society. Plants under both names have been fruited at the Station two seasons, and no differences have been discovered.

It is hard to reconcile Mr. Mohler's statement, that the Mohler is a seedling of the Eureka, with his postal card, and with other admissions; but should this be done, and he be able to prove that he did not rename the Eureka, and that his variety is a seedling of the latter, there still remains the fact that one cannot be distinguished from the other. The claim that the Mohler is an improvement upon the Eureka has not the slightest foundation, hence there is no reason why the former should be sold at a higher price than the latter, and the name Eureka is the only one that should be recognized. The postal card, above quoted, was slipped into the wrong place in the letter file, and could not be produced in evidence at the proper time.

Older.—A midseason blackcap of considerable merit, but not sufficiently distinct from other sorts to make it specially valuable.

Palmer.—This is still regarded as the standard among extra early blackcaps.

Pride of Kent.—A red variety of some merit, but lacking in productiveness. The plants are vigorous, the fruit is of good size and color, but not sufficiently abundant.

Royal Church.—A red variety, which has done well in some localities, but has not succeeded generally. It has been variable at the Station, sometimes proving satisfactory, but more often the reverse. The berries usually crumble in picking, but if this were not true, they are too soft for market, unless handled with great care.

Thompson.—This variety still sustains its reputation as an extra early sort. It commences to ripen early and matures the bulk of its crop within a very short time, making it particularly desirable where an early market is sought, but it must not be expected to take the place of more prolific midseason varieties.

Unnamed variety, from L. H. Reid.—A yellow sort, having fruit somewhat larger than Golden Queen, and not quite as firm. Possibly it may have some value for home use, but is not desirable for market.

SUMMARY.

The failures of apple crops in recent years have been largely due to the destructive action of the apple scab fungus.

This is shown by the fact that sprayed trees have often yielded fruit when others were barren, or partially so. In one case a sprayed tree gave about $3.00 worth of fruit more than an unsprayed tree alongside.

The trouble seemed to be at its worst in 1893, with some improvement in 1894, and disappeared almost wholly in 1895.

The cause of its cessation was the continued dry weather.

This condition cannot be expected to prevail beyond one or two seasons, and the former state of affairs may return at any time.

The office of a fungicide is to prevent the growth of fungi, hence the proper course to pursue is to take advantage of the present conditions, and to seek to hold the disease in check, by spraying.

It is advisable to spray young trees just planted, as well as those that are in bearing.

Two applications of Paris green have not kept the apple worm in check, but the past season four sprayings gave quite satisfactory results.

In spraying apple trees for the scab it is well to do as much of the work before the time of blooming as possible, and as little after that time as need be, because the mixture injures the appearance of some kinds, if used too late.

The Belmont, Benoni, Ben Davis, Early Harvest, Maiden's Blush, Newtown Pippin, Northern Spy, Rambo, Red Canada and Rome Beauty, are greatly benefited by applications of Bordeaux mixture.

Baldwin, Grimes' Golden, Jonathan, Peck's Pleasant, R. I. Greening and Roxbury Russet have not shown much improvement under the treatment.

Nearly all varieties of pears are improved by spraying, but not all in the same manner, and some are injured by late applications.

Bordeaux mixture is beneficial to plum trees, and the curculio may be held in check with Paris green, but the difficulty is increased in proportion as the plum trees are surrounded by other trees which harbor the curculio. At present it seems best to fight the curculio both by spraying and catching.

Peaches and American plums should be sprayed with half strength mixture, if applied when in leaf.

The most useful fungicide is the Bordeaux mixture, and in making it an excess of lime is advised. Copper carbonate and potassium sulphide are useful in a limited way, to replace the Bordeaux mixture where it cannot well be used.

Apple and pear trees should be sprayed with Bordeaux mixture twice before blooming, and once or twice after, according to variety, using six ounces of Paris green to a barrel of the mixture, the third and fourth times. Two more applications of Paris green, four ounces to the barrel, are advisable in some cases.

Three or four applications of Bordeaux mixture and Paris green are advised for plum trees, after blooming, using the curculio catcher still later.

Two sprayings, half strength, of Bordeaux mixture and Paris green combined, are advised for cherry trees, after blooming.

Grape vines require three or four sprayings with Bordeaux mixture; two before the fruit sets and two after; and two applications of copper carbonate still later.

Raspberry plants should be sprayed once before the leaves open, with Bordeaux mixture, and the young canes two or three times later, with the same, half strength.

Either Bordeaux mixture or potassium sulphide may be used for the mildew on gooseberry plants, and white hellebore for the currant worm.

A spray pump should have the parts with which the mixture comes in contact made of brass, or some material which will not corrode. The appliances needed for spraying large trees are about twenty-five feet of good rubber hose and ten feet of tubing, on the end of which the nozzle is fastened. A large air chamber is helpful, and some form of an agitator is necessary.

The most desirable new varieties of raspberries are Columbian, Eureka, Kansas, Lotta, Thompson and Early King. Gault, Mills' Nos. 7 and 15 require further trial.

All Seasons, Champion, Pride of Kent and Royal Church are not desirable.

Mohler is a synonym of the Eureka.